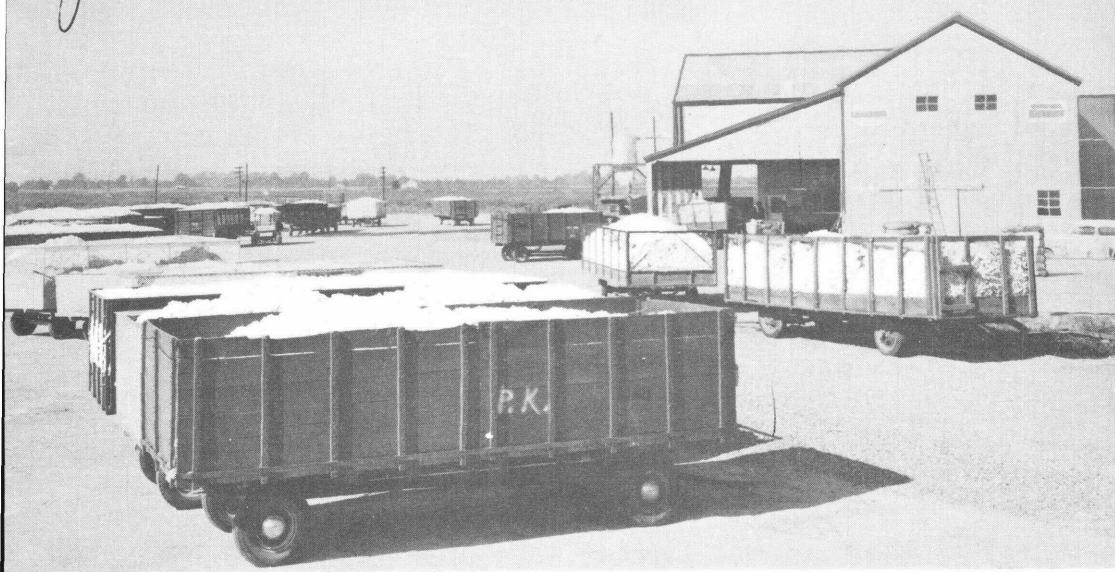


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Preserving  
**FIBER QUALITY**  
in Cotton Ginning  
for Maximum Returns  
to Producers

Farmers' Bulletin No. 2194

U.S. DEPARTMENT OF AGRICULTURE

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CURRENT SERIAL RECORDS

Ginning practices affect the quality of lint, which is reflected in the price that producers receive for their cotton. Producers pay for the services of ginning, and this bulletin is intended to help them obtain maximum returns for their cotton crops.

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This publication supersedes Leaflet 169, "Preventing Gin Damage to Cotton."

Washington, D.C.

Issued October 1963

# Preserving FIBER QUALITY in Cotton Ginning for Maximum Returns to Producers

Prepared by

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The ownership of harvested cotton rests with the producer until after the ginning operations are completed. The first sale, which places lint and seed in the marketing channel, does not normally occur until after ginning. Completion of this last step in production gives the farmer a salable product.

## PROBLEMS OF MODERN GINNING

Ginning is an essential part of the mechanization of cotton production. In some areas the use of mechanical cotton harvesters would be impossible without modern gins and without the ginning equipment designed to bring out the best of cotton's inherent quality despite rough harvesting. This equipment includes seed-cotton drying systems, seed-cotton cleaners, and lint cleaners. If properly used, this equip-

ment preserves fiber quality; if not properly used, it can damage the fiber.

As mechanical harvesting and rough hand harvesting have increased across the Cotton Belt, the ginner's job has become more complicated. It consists of much more than separation of lint from seed.

Speed of harvesting is a problem to the ginner because cotton is received faster than it can be ginned, and the ginner may have to resort to some form of storage. But the chief difficulties have to do with drying and cleaning. Mechanically harvested cotton usually contains more moisture and foreign matter than does cotton harvested selectively by hand.

To produce lint that can compete in the domestic and world markets with foreign growths and with man-made fibers, cotton ginner must give attention to preservation of

fiber quality at all stages of ginning. The effort should begin with the handling of seed cotton as it is received on the gin yard.

## RECEIVING SEED COTTON AT GINS

Cotton is hauled from the field to the gin in trucks or trailers. These modern conveyances are essentially bins for receiving cotton from the pickers in the field, transporting it, and holding it for ginning. Their capacity is such that they will "gin out" from one to six bales.

During rush periods of harvesting, trailers may stand on the yard up to several weeks. Therefore, it is necessary for the ginner to know the condition of the seed cotton on his yard.

Visual inspection by a competent worker can determine the approximate moisture content of a load, and the amounts and kinds of trash. Many ginner find that an electric moisture meter is most helpful in determining which bales must be ginned immediately and which can be held without heating.

In a one-variety area, it is not necessary to consider variety when inspecting incoming cotton. But if more than one variety is grown in the area served by a gin, the name of the variety in each load should be obtained from the producer, especially if there is a difference in staple length.

Method of harvest—machine or hand—is an inspection factor wherever more than one method is practiced. Over 60 percent of the cotton in the U.S. is harvested mechanically, and in some areas al-

most all the crop is harvested by this method.

Other information that should be recorded for each load of seed cotton received: Date of receipt, owner's name, and (where truck scales are available) load weight.

## GIN YARD TREATMENTS

### Grouping

Incoming cotton should be grouped as to moisture content, foreign-matter content, and variety. Grouping facilitates ginning because it reduces—

- Adjustments in drying, cleaning, and ginning machinery.
- Equipment cleanout.
- Seed-roll dropping.

If loads of seed cotton varying widely in moisture content are ginned without grouping, frequent changes must be made in drying temperatures. Without such changes, some loads will be overdried at the expense of quality or some will not be dried enough for smooth ginning and efficient cleaning. Because of the slow response of the conventional drying system, it is not practical to make the wide-ranging changes in drying temperature that are necessary to prevent overdrying or underdrying parts of the cotton.

Most modern gins employ enough cleaning equipment, both for seed cotton and for lint. Seed cotton should be cleaned only enough to produce a grade consistent with its color. Further cleaning removes weight without improving quality, and may reduce returns to the producer. Excessive cleaning damages

fiber and adversely affects mill processing.

Variety grouping is important in areas where differences in staple length are pronounced. Dumping of seed rolls and a general cleanout of the gin may be necessary to maintain sharp separation between varieties and to obtain maximum grades. These practices may also be necessary to prevent two-sided bales when trashy cotton is followed by clean cotton.

Producers who bring carefully handpicked cotton to the gin expect higher grades for their trouble. Grouping of such cotton will save the producers from disappointment. It is costly—to producers and ginners—to clean and dry carefully handpicked cotton with the same equipment that is used in processing machine-harvested cotton. Therefore some of the cleaning equipment can be bypassed.

### **Storage**

There are several methods of storage. They include trailer storage, cotton-house storage, and storage in portable baskets. Trailer storage is the most common method. Cotton-house storage is expensive, and fire-insurance rates are almost prohibitive. Portable baskets having a capacity of 1 to 12 bales are used for transporting cotton and for storing it on the gin yard. (The 12-bale baskets are used only for storage at the gin.)

In areas of frequent rainfall, some type of protection from the weather, either shed space or waterproof tarpaulins, should be provided for cotton in trailer or basket storage.

If seed cotton contains excessive moisture on arrival at the gin, or is dampened by rain while on the yard, action should be taken at once to prevent overheating. The best course is to gin the cotton promptly. If this is not possible, the cotton should be spread out, or transferred from one trailer to another. A few gins have equipment for handling damp cotton that cannot be ginned immediately. In some the equipment consists of a simple suction system for transferring the cotton from one trailer to another. In others there is a more elaborate system that includes a drier and some cleaning equipment.

Seed cotton having a moisture content below 12 percent is considered safe for trailer storage unless it contains a large amount of green-leaf material. Cotton with a high green-leaf content should be processed immediately to prevent staining and internal heating. If such cotton is left for even short periods, internal heating causes "hot spots" to occur in it; these may stain the cotton.

Backlogs of unginned cotton on the yard discourage new business, and it has been argued that increasing operating hours and gin capacity are preferable to any kind of large-scale storage of seed cotton.

In the small minority of gins that still employ cotton-house storage, any seed cotton that is so stored should be clean and should contain less than 12 percent of moisture. In the past, most handpicked cotton was clean and dry enough for cotton-house storage. But cotton harvested green, or damp, or with a preponderance of

green bolls or foreign matter is not suitable for such storage and should be processed.

## **GINNING**

The farmer knows that ginning cannot improve the quality of the fiber in his cotton, but he wants that quality to be preserved. Preservation depends on proper operation of the gin.

### **Bulk Feed Controls**

As the seed cotton enters the gin it passes into a large bin or hopper that feeds the drying and seed-cotton cleaning equipment in an even flow regulated to its capacity. Automatic controls within the bin also regulate the flow of incoming cotton by a valve arrangement that stops the unloading of the wagon. Thus, a working balance of seed cotton is maintained in the bin. Commercial automatic feed-control units vary in design and in installation details, but they have been proved effective and are employed in most modern gins.

Advantages of these controls are that they prevent wide fluctuations in rate of feed, minimize machinery chokages, and make the entire ginning operation more efficient. Also, the feed control assists in maintaining maximum operation of all the stands and keeping the overflow to an absolute minimum.

Reducing overflow is important in relation to fiber quality because pickup from the overflow in many gins reroutes the cotton through the drying and cleaning machinery, and this rerouting results in overdried,

over-machined samples. Since this is generally the last cotton that goes in the bale, one of the two segments of the sample will contain it. The result will be a "two-sided" or "plated" bale. It is recommended that another separator be installed so that the seed cotton from the overflow is returned directly to the distributor, thus bypassing the cleaning and drying equipment.

### **Drying Seed Cotton**

The amount of moisture in seed cotton at the time of ginning is the most important factor affecting cotton quality.

Practically all gins in the U.S. are equipped with one or more driers, and are prepared to process cotton under the most adverse drying conditions.

Following are general guides for drying seed cotton:

- Adjustment of the drying system should be established on the basis of the moisture in the wagon sample and the moisture content of the lint at the lint slide.

- Driers should be regulated so as to present cotton to the gin saw in the 5- to 7-percent lint moisture range.

- The amount of moisture to be removed should be increased or decreased by increasing or decreasing the temperature or the time of exposure, or both.

Seed cotton containing excessive moisture passes through the cleaning and conveying machinery in wads, which may cause chokages and inefficient cleaning. When it is



ginned damp, "rough preparation" samples are produced. This results in lower grades.

If the cotton is dried excessively, it may lose its waxy coating and become brittle. It cleans more readily, but fibers are weakened or broken in the cleaning and ginning. This results in an increase in "short fiber content" and adversely affects ginning.

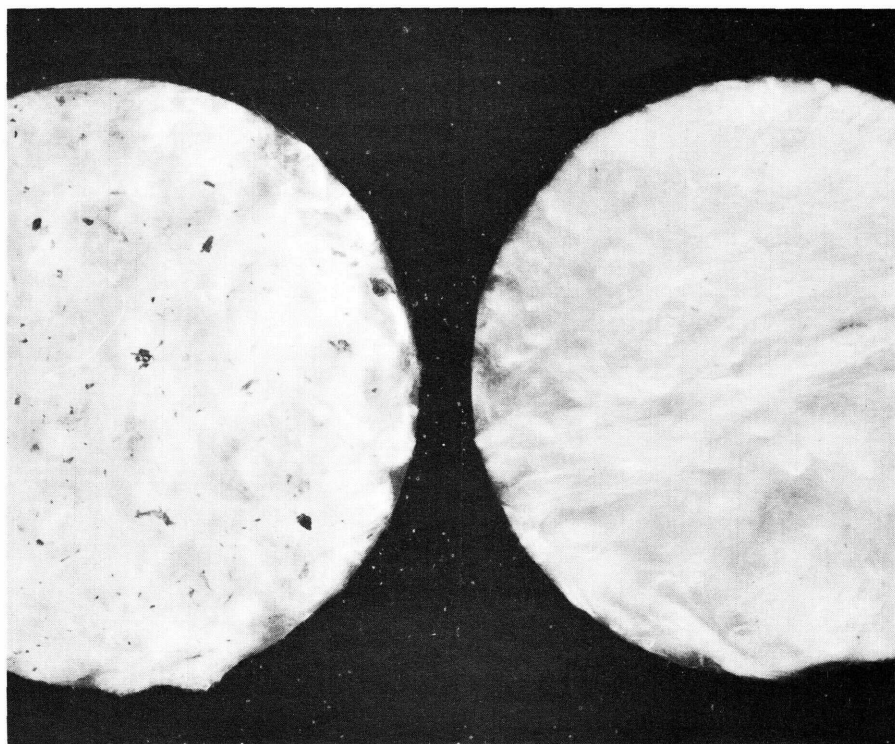
In the arid areas of the Southwest, seed cotton often comes from the field at moisture levels below the 5- to 7-percent level. Commercial equipment is available for restoring moisture prior to ginning.

There are good grounds for stat-

ing that artificial overdrying of cotton causes increase in short fibers and reductions in spinning quality. High correlations have been obtained between short fibers and—

- Low yarn strength.
- Increase in "ends-down" in the mill.
- Increase in manufacturing waste.

Much research has been done in an effort to eliminate the need for manually controlling seed-cotton drying systems. In 1959 the USDA Cotton Ginning Research Laboratories demonstrated continuous automatic moisture-measuring de-



BN-19700

**Left, Cotton improperly dried and poorly cleaned; right, cotton well cleaned after proper drying.**



vices. In 1961 the USDA introduced a means for automatically controlling drying operations. In 1962 manufacturers were incorporating these or similar devices in their new drying equipment.

### **Cleaning Seed Cotton**

The amount of cleaning needed by seed cotton and the kinds of cleaners that should be used depend on the kinds of trash in the cotton.

Clean handpicked cotton, little of which comes to gins today, needs little cleaning; a few cylinders of conventional cleaning usually will suffice. In contrast, gins have installed a variety of cleaning devices for cotton harvested by machines or by rough hand methods. These include rock and green boll separators, cylinder cleaners with screens or grid bars, bur extractors, and stick and green-leaf removers. They can be used in various combinations. Usually, bur extractors and stick and green-leaf removers are installed between two cylinder machines. Such cleaners may have as many as 10 cleaning cylinders.

Most modern gins are equipped to clean seed cotton containing amounts of trash that are maximum in their areas. It is important to remember that not all the cotton received at a gin has to be put through all the cleaning and extracting equipment available at the gin. Bypass valves should be provided to prevent overcleaning. No more foreign matter should be removed than is necessary to produce the grade that is determined by the color of the sample. Further cleaning reduces the weight without raising

the unit selling price of the ginned product.

### **Gin Stands**

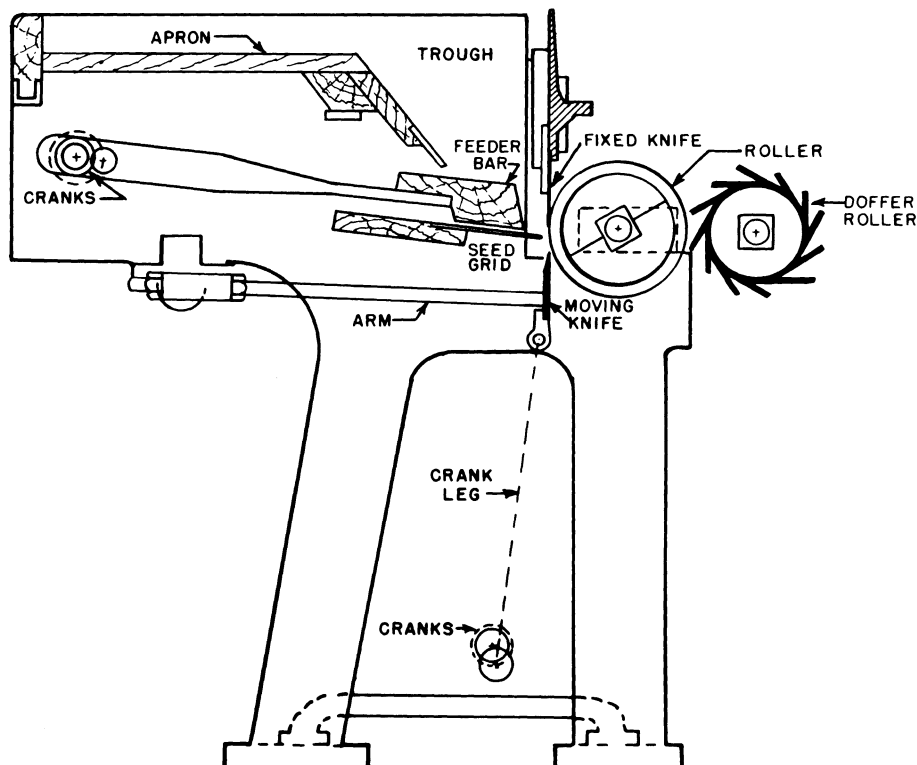
The gin stand is the heart of the ginning operation, for it is here that the actual separation of the lint from the seed takes place.

There are two types of gins—roller and saw. Saw gins may be brush or air blast. Roller ginning is the only satisfactory method of preserving the quality and fiber properties of the extra-long, silky varieties of American-Egyptian cottons grown to a limited extent in the Southwest. This segment of the American crop is less than 1 percent of the total for the Nation.

The general recommendations below pertain to the saw gin, which has evolved from the gins patented by Eli Whitney in 1793 and Hodgen Holmes in 1796, and is used in ginning the great bulk of the world's cotton. The substance of most of these recommendations is contained in manufacturers' instruction manuals, which gin operators should keep handy for reference.

### **Gin Saws**

Gin saws become dull and teeth are broken out by sticks and other foreign matter in the seed cotton. They should be inspected frequently and replaced before they are reduced more than one-sixteenth inch in diameter by wear and sharpening, and before more than 7 percent of the teeth are missing. Regular replacement is necessary to maintain normal ginning capacity, prevent losses in turnout, and prevent damage to the lint.



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**Sectional view of a roller gin.**

### ***Seed Roll***

For highest efficiency in ginning quality cotton, maintain a loose seed roll. Seed-roll density is generally considered to depend on rate of feed, the mechanical condition of the gin, and the setting of the seed fingers. Speed of the gin saws and of the brush doffing cylinders is different in different makes and models of gins; manufacturers' recommendations in service manuals should be followed closely.

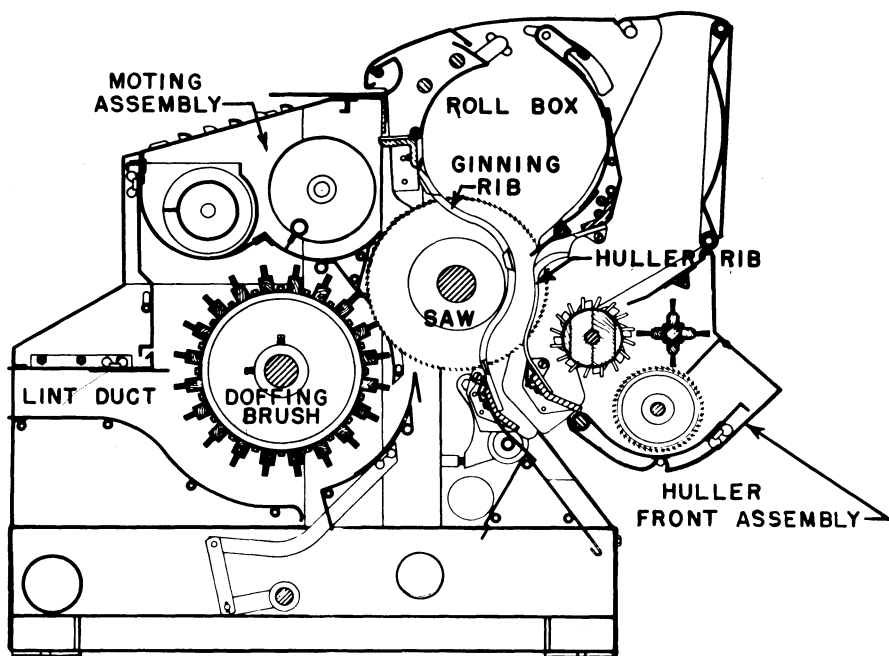
### ***Doffing Systems***

American-manufactured saw gins employ air-blast or brush doffing

systems. There are about twice as many air-blast gins as there are brush gins. In air-blast gins, nozzle orifices and air pressures should be checked frequently, and screens should be kept clean. The brushes on brush gins should be maintained in good condition.

### ***Seed, Mote, and Dividing Boards***

The position of the seed board partly controls the rate of discharge of the ginned seed from the roll box, and it partly controls the density of the seed roll. The board should be set to allow full passage of cleanly ginned seed from the roll box; this helps prevent tight seed



BN-19704

**Sectional view of a saw gin with brush doffer.**

rolls. These settings depend on the characteristics and condition of the cotton and on the rate of feed into the roll box.

In gins that have adjustable mote boards, the boards should allow as much discharge of foreign matter and motes as possible without loss of good fiber.

In brush gins the dividing board between saw and brush cylinders should be kept to factory size and position, because the size and position of the board affect the action of the brush in doffing. The back-board and scroll above the brush at the back of the gin stand must be free from wear, and must be kept close enough to the brush tips to prevent the accumulation of fly and lint in a wad above the brush.

## **LINT CLEANERS**

Lint cleaning has developed rapidly since it was introduced in the late 1940's. Most gins in the U.S. are equipped with one or more lint cleaners.

These cleaners are of two general types—saw and air jet. They are used in series. Some gins have as many as three stages. Since some cotton does not require the full treatment, cleaners should be equipped with bypasses.

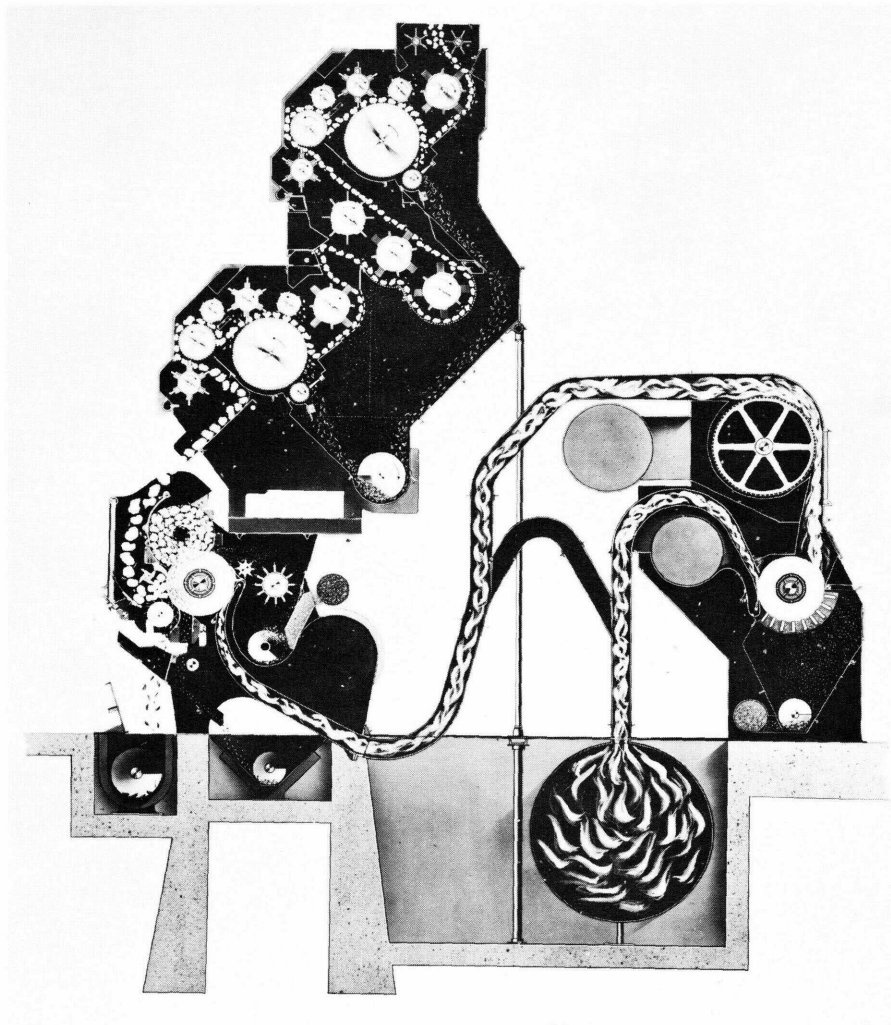
Without these cleaners, high-quality ginning of rough hand-harvested and machine-harvested cotton would be impossible. In general, their use increases as the season progresses and cotton becomes

more trashy and discolored by weather.

Although lint cleaners are indispensable to producers and ginnermen of rough-harvested cotton, they are sometimes deplored by spinners. If they are used improperly or excessively in conjunction with over-

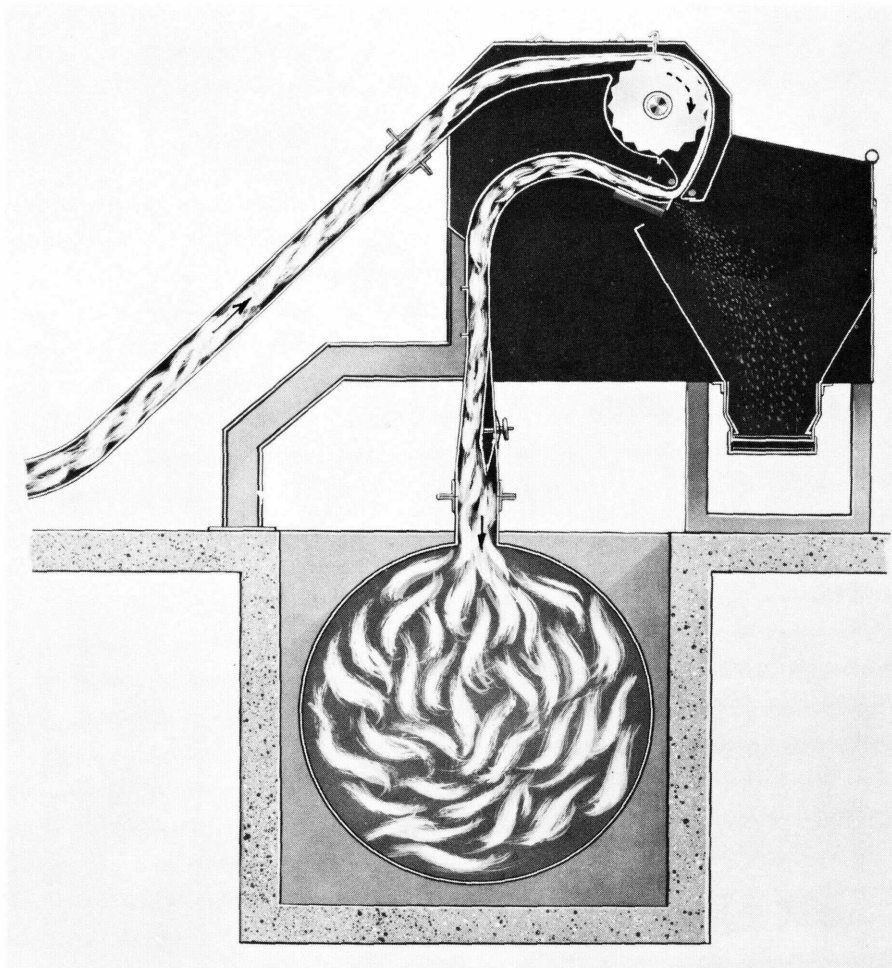
drying, spinners' complaints are justified.

Lint cleaners can contribute much to preservation of grade, but their maximum overall benefit can be realized only through careful inspection of their operation and through adherence to manufacturers' recommendations.



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**Saw-type lint cleaner.**



BN-19899

**Air-jet lint cleaner.**

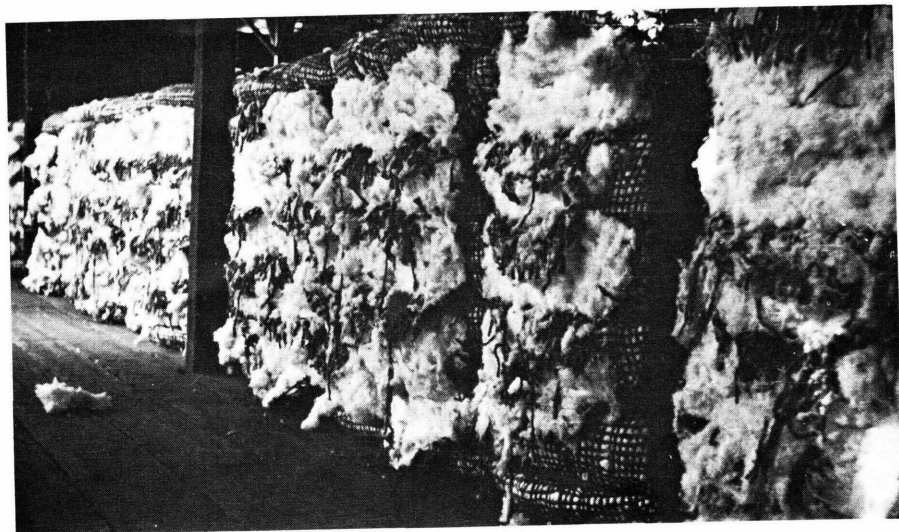
## **SAMPLING**

Sampling is necessary for evaluating bales of cotton. While correct and proper sampling of each bale is necessary in determining its market value, sampling is often practiced excessively and performed improperly.<sup>1</sup>

<sup>1</sup> "The Classification of Cotton," USDA Miscellaneous Publication 310; revised June 1956.

Sampling is accomplished by cutting through the bagging on both sides of the bale with a knife or saw and obtaining a little less than one-half pound of lint from each side. Usually this is done by one of the pressmen for the purpose of obtaining a Government Smith-Doxey class for grade and staple at the request of the producer. Subsequent buyers interested in purchasing the bale usually cut additional samples and make independent evaluations.





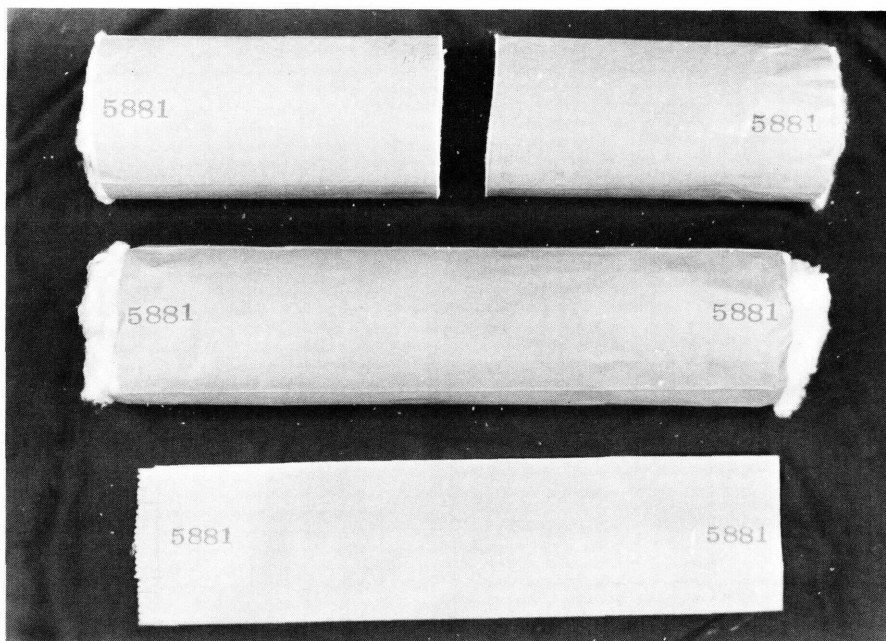
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**Cotton bales that have been sampled four or five times by the knife method.**



BN-19703

**Cotton bales sampled by an automatic sampler at the gin.**



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**Sample of lint cotton produced by automatic sampler. *Top*, Sample cut in two; *center*, whole sample; *bottom*, empty sample wrapper.**

As a result, when the bale reaches the processor, it is often very poorly wrapped. This condition is serious and causes much complaint, especially in foreign markets.

Automatic sampling devices have been used rather extensively in some gins. Buyers are reluctant to accept this method of sampling, and primarily for this reason the practice has not been widely adopted. Part of this reluctance is due to the fact that the present evaluation system is at best an art and not a science. Therefore each buyer wants a sample that no one else has handled—a sample from which no trash has been shaken out. Furthermore, it is the practice in the trade for the

buyer to keep the sample whether he buys the bale or not. Over the period of a year this “loose account” becomes a rather tidy sum in many instances.

Hope for general acceptance of automatic sampling lies in the prospect of better communication between farmers and merchants and in the recognition on the part of buyers and mills that the automatic sampling is more representative of the bale than the conventional cut sample. Automatic sampling will be a requirement when reliable methods of bale evaluation are developed, because an evaluation system is no better than the sample on which it is based.



## PRESSING

Generally, cotton is baled at the gin in one of two densities—about 12 pounds per cubic foot (flat bale) or about 23 pounds per cubic foot (standard density). Hydraulic press pumps at the gin are fairly well standardized and require only normal maintenance. Production of standard-density bales requires stronger presses than those used in producing flat bales; the presses have more or larger hydraulic rams and higher press pump pressures. Bales that are to be exported are compressed to a density of about 33 pounds per cubic foot by heavy steam presses.

Bales are usually covered with a loosely woven jute material, although bagging made from low-grade cotton and other materials are acceptable if they weigh the same as the jute covering. Twenty-two pounds tare is allowed for bagging and ties. Bales are tied with steel straps that vary in number according to the density. The American flat bales have six bands and the standard and high-density bales have eight.

In some gins that have installed high-capacity gin stands but have retained their old-style presses, the pressing operation has become a bottleneck because conventional, old equipment cannot press the bale as fast as cotton comes from the gin. Many of the presses are being renovated or discarded for better de-

signed new presses that have automatic controls, high-capacity pumps, and improved tramping devices, which speed up the pressing operation.

## SEED AND TRASH DISPOSAL

After the seed has been separated from the lint, it passes through conveying systems into seed scales for weighing and thence into a seed bin, or house, where it is stored until delivered to the oil mills. Seed that is kept for planting the next year may be cleaned, delinted, and treated, but these operations are usually not the responsibility of a commercial gin.

Trash that includes motes, burs, sticks, and other extraneous material is conveyed, by mechanical and air methods, to a central location well away from the gin. If the material is to be returned to the farm, some type of storage is provided. It is usually caught in a trash bin or hopper and then dumped into specially built trailers or bur spreaders and returned to the land. Otherwise it is conveyed to an incinerator and confined for burning.

Air systems are usually employed to gather up the short fine lint, or "fly," and convey it into high-efficiency cyclones. Without an efficient disposal system, gin trash in the air can become a serious public nuisance, and several gins have been sued because of it.

## **CHECK up on these accident hazards around your farm . . .**

- ✓ Is farmyard clear of tools, broken glass, loose strands of barbed wire, nail-studded boards?
- ✓ Are water tanks, cisterns, and wells protected?
- ✓ Are ladders and steps in good repair?
- ✓ Are pitchforks, rakes, shovels, and other sharp tools kept in racks?
- ✓ Are electric circuits and appliances in good condition?
- ✓ Is unused lumber carefully stacked?
- ✓ Are buildings and fences in good repair?



**clean up your farm**

**to make it attractive and SAFE**